# NOTES, ABSTRACTS, AND REVIEWS

*Arctic ice and British weather.*—For many years meteorologists have played with the idea that the weather secrets of temperate latitudes are to be sought in the frozen north. The theory of action centers suggested a mechanism by which polar ice may influence seasonal changes, and the development of the theory of the polar front showed how Arctic conditions could dominate day to day changes. After lying almost dormant for many years, the idea has lately begun to find expression in both practical and theoretical researches. Prof. W. H. Hobbs' expedition to Greenland, which had for one of its principal objects the establishment of a station on the inland ice, is one example of the practical side, and another is the recent trans-Arctic flight of Capt. Sir George Wilkins, whose program included the search for sites on which permanent meteorological stations could be established. On the theoretical side reference has been made in a previous number of the Meteorological Magazine [1] to the work of W. Wiese, but this is naturally concerned more with the weather of Russia than with that of western Europe.

A statistical investigation of the influence of Arctic ice on the pressure distribution over western Europe

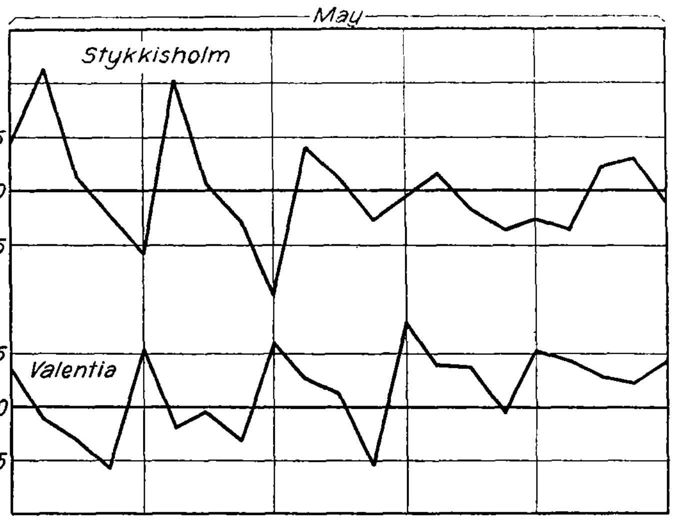


FIG. 1.—Correlation coefficients; ice index figures and the quarterly pressure during the following five years

which has recently been published as a Geophysical Memoir [2] shows that the matter is sufficiently complicated, the influence varying with the season in a way which suggests that it is due to a combination of several factors, some acting in one direction, some in another. As a result, the correlation coefficients obtained, while sometimes appreciable, are never high, though they are sufficiently confirmed by various checks to show that they are real.

The area dealt with in the Arctic is divided into four parts, the neighborhood of Iceland and Greenland, Barents, and Kara Seas. The ice conditions in these areas in spring and summer are known mainly from the annual survey of the Danish Meteorological Institute,[3] and these ice figures were correlated with quarterly means of pressure at nine selected stations covering an area from Jacobshavn (Greenland) and Vardo (Norway) in the north to Ponta Delgada in the south and Berlin in the east. As a result, three relationships were found, the first two of which were suspected before, while the third appears to be not only new, but surprising:

(1) When there is much ice in the Arctic, pressure in spring and summer tends to be above normal in the northwest (Jacobshavn, Stykkisholm and Thorshavn) and below normal in the southwest (Ponta Delgada).

(2) When there is much ice in the Arctic in the spring and summer, pressure in the following late autumn and winter (November to January) tends to be below normal over the British Isles and northern France.

(3) Similar effects tend to recur annually at northern stations for about four years following abnormal ice years. (See fig. 1.)

The memoir in question is concerned more with the presentation of facts than with the discussion of their causes, but the third result was sufficiently curious to arouse speculation. It must first be remarked that there are two chief ways in which Arctic ice may affect the distribution of pressure. In the first place ice and ice-cold water cool the air above, and since cold air is heavy, the presence of a large cold area tends to raise the barometric pressure in its neighborhood. On the other hand, the Icelandic low is generally regarded as intimately related to the general circulation of the atmosphere, so that when this circulation is vigorous, pressure at Stykkisholm is below normal. The atmospheric circulation is in turn related to the temperature difference between poles and Equator, so that much ice in the Arctic, by increasing this temperature difference, should lower the pressure at Stykkisholm. Thus there are two opposing tendencies, one toward a higher pressure and the other toward a lower pressure at Stykkisholm in years of much Arctic ice, and it may well be that the first tendency prevails at one season, the second at another. Let us see how they may operate.

Dealing first with the tendency for much ice to raise pressure, it appears that the relatively small amounts of ice which appear off Iceland in spring and early summer are not likely themselves to have a great effect. It is when they begin to melt and to cover the surface of the northernmost Atlantic with a thin sheet of cold thaw water, that we should expect the effect to be most noticeable. The greater part of the break up of ice from the East Greenland Current takes place in summer, and it is in this season that we should look for the greatest tendency for much Arctic ice to raise pressure near Stykkisholm. On the other hand, we should expect the effect on the general atmospheric circulation to be greatest in January to March, when the ice in the Arctic basin itself is most solid and extensive. Moreover the Icelandic low is intense in winter, feeble in summer, and for both these reasons we may anticipate that the tendency for much Arctic ice to lower pressure over Iceland will be greatest in winter.

We come next to the recurrence of similar tendencies at the same season in several successive years. That this is real is shown by Figure 1, reproduced from the original memoir, showing the correlation coefficients between an "ice index" figure obtained by combining the ice data from Greenland, Barents and Kara Seas, and the quarterly pressures at Stykkisholm and Valentia during the following five years. It is not until the fourth or fifth year that the regular recurrence of positive and negative coefficients breaks down. There can be little doubt that this recurrence is due to the persistence of the main mass of Palæocrystic ice, of which the variable ice areas in the

[1] Vol. 61, 1926, p. 29.
[2] The influence of Arctic ice on the subsequent distribution of pressure over the eastern North Atlantic and western Europe. By C. E. P. Brooks and Winifred A. Quennell. London. Meteor. Office. Geophys. Memoirs No. 41.
[3] Isforholdene i de Arktiske Have. Copenhagen, Dansk Meteor. Institut.

outlying seas are merely the fringes. The Palæocrystic ice is believed to form mainly to the north of Siberia, whence it drifts slowly across the Arctic Ocean, part of it finally reaching the East Greenland Current. The passage across the Arctic takes about four years, so that if a large amount of ice is formed north of Siberia in any one year, we may look for its effects during the following four years. Each summer it sheds some ice from its fringes, and the thaw water brings high pressure to Iceland, while each winter it strengthens the atmospheric circulation and deepens the Icelandic low.

The tendency to low pressure at Valentia which recurs each autumn after much Arctic ice may be tentatively attributed to storminess resulting from the introduction of streams and patches of cold thaw water into the warm Gulf Stream Drift of the North Atlantic. The same phenomenon is observed, though less definitely, in the winter following a year with much ice off Newfoundland, an effect which is also investigated in the memoir, but with the Newfoundland ice there is very little if any recurrence in the second year.—*C. E. P. Brooks.*

*Two cold winters coming in France?*—Director H. Memery, Observatoire de Talence (Gironde) has for some time been publishing discussions on the apparent effect of sun spots on the weather. His latest paper, Les Variations Solaires font Prévoir des Hivers Froids en 1929 et en 1930,[1] presents two points on sun spot weather relationships. The first is that since 9 sun spot periods equal 100 years, we should expect to find much the same sequence in sun spot numbers by seasons and, if sun spots control weather, likewise the same general sequence of seasonal abnormalities now as occurred just 100 years ago. M. Memery draws a comparison of 13 of the seasonal abnormalities of 1788–1828 with those of corresponding years 1888–1928, and shows a similarity so marked as to lead him to believe that the cold winter of 1829 and the rigorous winter of 1830 are likely to indicate that his next two winters, 1928–29 and 1929–30 will be cold. He refrains from making a definite forecast to this effect, however.

The other point in his discussion is on the question, if sun spots control the weather to this extent, why is there not similar weather every 11 years? This he seeks to answer by pointing out that the sun spots do not increase and decrease uniformly but change irregularly, there rarely being increases or decreases lasting as much as six months in the same direction. While he associates high summer temperatures, such as those of 1928, with increasing sun spots at high numbers, he indicates that this combination of solar conditions in the summer months does not occur during every sun-spot maximum. He believes that the great solar activity in August, 1928, marked the peak of the present sun spot cycle and that decreasing solar activity this winter is likely and that it may bring low winter temperatures in its train.—*C. F. B.*

*Auroral observations of the "Maud" expedition.*—"Aurora Photographs" is the title of a paper by Ragnvald Wesøe representing No. 6 of volume 1 of the scientific results of the Norwegian north polar expedition with the *Maud*, 1918–1925, published in Bergen, 1928. The positions of auroral arches over the Arctic Sea north of eastern Siberia when mapped in conjunction with those farther west, and particularly over Scandinavia form arcs of a circle centering in northwest Greenland. The monograph contains especially fine photographs of the aurora. Assuming the basal height to have been 110 kilometers two of the tops of streamers measured were below 150 kilometers, three under 200 kilometers, and only one reached an elevation of 288 kilometers.

[1] Bull. de l'Observatoire de Talence (Gironde) 2e ser. no. 4, Oct. 15, 1928, p. 17–20.

The other parts of the scientific results of the *Maud* expedition that have been published are: Results of Astronomical Observations on the Properties of Sea Ice; Magnetic, Atmospheric-Electric, and Auroral Results; The Wind-Drift of the Ice on the North Siberian Shelf.—*C. F. B.*

*Conduction of heat through sea ice.*—The late Dr. Finn Malmgren, who so lamentably met his death on the sea ice after the crash of the *Italia*, made a most thorough investigation on the properties of sea ice while on the *Maud*. A monograph containing his results has been published (Bergen, 1927) as No. 5 of volume 1 of the Scientific Results of the Norwegian North Polar Expedition with the *Maud*. Of interest to meteorologists is his computation of the heat that is conducted through the polar ice covering to the atmosphere during the colder months—7,670-gram calories per square centimeter from September to April. This is one-ninth of the heat discharge by the Mediterranean as measured by Aimé. It is enough, however, to raise the temperature of the lowest 150 meters, the cold layer of air over the polar sea by 6.9° C. in one day. Doctor Malmgren concludes:

> The great acquisition of heat by the atmosphere above the Polar Sea during the winter via the ice from the warm water of the sea greatly contributes to diminish the cold of winter and explains the fact that, despite the clear winter sky and the calm weather, we have over the Polar Sea considerably milder winter temperatures than farther south over the continent of Asia.[1]
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> —*C. F. B.*

*Rainfall of Australia.*—The rainfall map of Australia for 1927, published by the Commonwealth Bureau of Meteorology of that country, has just come to hand. Among other interesting information it shows the areas of the Commonwealth that have had more than the average rainfall for each year since 1908. The statistics are reproduced in the table below and it is to be noted that there is little correspondence between the rainfall in that country and the United States of North America, for example. The year 1910 in Australia was a year of generally abundant rains, yet it was one of the driest ever experienced in the United States; 1917 was much the same, but 1916 was a year of rather generous rains both in the United States and Australia.

TABLE No. 1.—*Per cent of area in Australia having greater than average rainfall*

| Year | Per cent | Year | Per cent | Year | Per cent |
|---|---|---|---|---|---|
| 1908 | 33 | 1915 | 26 | 1922 | 21 |
| 1909 | 40 | 1916 | 60 | 1923 | 22 |
| 1910 | 75 | 1917 | 75 | 1924 | 27 |
| 1911 | 25 | 1918 | 28 | 1925 | 24 |
| 1912 | 12 | 1919 | 13 | 1926 | 21 |
| 1913 | 27 | 1920 | 54 | 1927 | 34 |
| 1914 | 11 | 1921 | 63 | | |

*Retirement of Mr. J. H. Field as director-general of Indian meteorological observatories.*—We learn from the report on the administration of the meteorological department of the Government of India for 1927–28 that Mr. J. H. Field was retired from service in March, 1928, under the superannuation rule. Mr. Field, who joined the meteorological department, in 1904 will be remembered for the very large part that he took in the development of upper-air research in India, a problem that occupied the greater part of his service in that country; he was also responsible for the creation of the upper-air observatory at Agra in 1914, and but recently proposed a method of forecasting the winter rainfall of northern India from upper-air data. He was succeeded as director-general by Mr. C. W. B. Normand.—*A. J. H.*

[1] Cf. H. U. Sverdrup: The North-Polar Cover of Cold Air. Mo. Weath. Rev., 1926, 56: 53.